CSC207.01 2013F, Class 30: An Introduction to Sorting

Overview

- Preliminaries.
  - Exam 1 returned. Makeups due Thursday at 10:30 p.m.
  - Admin.
  - Questions on HW7
  - A few notes on Exam 1
- The problem of sorting.
- An object-oriented approach.
- Testing our sorting algorithm.

Admin

- I will return exam 1 at the beginning of class.
- I returned HW 6 via email. I still plan to grade HW 5. I will not grade HW 2-4, but will give you all checks. (Sorry, it doesn’t seem worth grading at this point.)
- Today we will continue the approach of "think for a few minutes, share with the class; if there’s time left, repeat". I have some lab activities planned for tomorrow, but also some full class activities.
- Upcoming extra credit opportunities:
  - Study abroad in Budapest session, Wednesday, Lunch, Science 3821
  - Learning from Alumni, Thursday: Jordan Shkolnick ’11 (Microsoft)
  - CS Extras, Thursday: ??? (Maybe not)
  - CS Table, Friday: Forthcoming

HW 7

How do we deal with predicates in search/select

From the exam ...

```java
public interface Predicate<T> {
    public boolean test(T val);
}
```

So, for testing ...

```java
public class IsEven implements Predicate<Integer> {
    public boolean test(Integer val) {
        return (val % 2) == 0;
    }
}
```
Can we make doubly-circularly-linked lists? Yes.

Notes on Exam 1

- Unit testing and the DNF
- Analyzing run times
  - $1 + 2 + 3 + 4 + \ldots = n(n+1)/2$. Remember Gauss
  - $1 + 2 + 4 + 8 + \ldots + 2^k = 2^{k+1} - 1$. Thanks
  - What credit do we get for redoing problems?
  - The average of the old and new grade

Was Sam overly harsh on HW6?

- No, but he’ll change most of the grades. If you wrote correct code, check, even if you didn’t do two versions.

The problem of sorting

- We have a bunch of stuff and want to put it in order.
- Questions:
  - What type is “bunch of stuff”? Something ordered, like an array or list
  - What does “in order” mean? It depends on the type. For strings it could be alphabetical, or size, or...
    - In Java, we could use the “natural” order, using compareTo
      - Identifiable because our code crashes when compareTo doesn’t exist
      - Or Java won’t compile
      - Or Eclipse underlines
      - Or use Comparables
    - Use Comparators

An object-oriented approach

- Let’s say I want to write N different sorting algorithms and be able to substitute in the sorting algorithm of choice. What do I do?
- Design classes, interfaces, and methods

Signature for the sort method?

```java
/**
 * Sort an array in place, using comp to arrange values.
 *
 * @pre
 * We can safely apply comp to any pair of elements in unsorted.
 * A.k.a "For all, i, j, 0 <= i, j < unsorted.length,
 * comp(unsorted[i],unsorted[j]) does not throw an exception.
 * @post
 */
```
For all reasonable $i$, \( \text{comp.compare(unsorted}[i], \text{unsorted}[i+1]) \leq 0 \)
* unsorted is a permutation of the original unsorted
*/

public void sort(T[] unsorted, Comparator<T> comp);

How do we 'package' it up (not put it in a Java package)?

**Testing our sorting algorithm**

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